

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA15 | Greatworth to Lower Boddington  
**Data appendix (LQ-001-015)**  
Land quality

November 2013

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Department  
for Transport

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# 1 Introduction

1.1.1 The land quality appendix for the Greatworth to Lower Boddington community forum area (CFA15) comprises:

- a summary of engagement undertaken (Section 2);
- detailed risk assessment (Section 3);
- inspection notes and other site data (Section 4);
- geological sites of special scientific Interest (SSSI) and local geological sites (LGS) (Section 5); and
- mining and minerals data (Section 6).

1.1.2 Maps referred to throughout the land quality appendix are contained in Maps LQ-01-035 to LQ-01-041 in Volume 5, Land Quality Map Book.

## 2 Engagement

- 2.1.1 Table 1 sets out the local authorities and other organisations that have been engaged with during the preparation of the land quality section of the environmental impact assessment (EIA) for this study area, the types of information that have been provided to the assessment team and any specific concerns of those with whom the team engaged.

Table 1: Engagement on land quality issues undertaken for the Greatworth to Lower Boddington study area.

Local authority or other organisation	Method/dates of contact	Information provided and/or specific concerns
Cherwell District Council (CDC)	Contact via email on: 28 September 2012; 13 December 2012; 6 February 2013; 7 February 2013; and 14 February 2013.	CDC supplied the requested EIA information, including specific planning policies and guidance relating to contaminated land and for information on any sites in the vicinity of the route with potential land contamination or with possible contaminative history. CDC supplied a screen shot of the disused railway near Mixbury to further define the area under inspection.
Northamptonshire County Council (NCC)	Contact via email on: 6 November 2012; and 6 February 2013.	NCC supplied requested information regarding mineral extraction/resources and landfill information with information from searches and Geographical Information System (GIS) files showing mineral safeguarded areas.
Oxfordshire County Council (OCC)	Contact via email on: 29 October 2012; 8 January 2012; 21 February 2013; and 18 March 2013.	OCC supplied requested data regarding mineral areas for assessing sterilisation of resources and landfill data with a GIS layer in a MapInfo format.
South Northamptonshire District Council (SNDC)	Contact via email on: 3 October 2012; 13 December 2012; 6 February 2013; 15 March 2013; and 9 April 2013.	SNDC confirmed it does not have data relevant to specific planning policies or guidance related to contaminated land or potential land contamination or with possible contaminative history and the location of potential underground storage tanks (UST).
Environment Agency	Contact via email on: 24 April 2013; 15 May 2013; 24 May 2013; 12 June 2013; 14 June 2013;	The Environment Agency has been contacted to supply information on landfills within the study area - data outstanding at time of production of this report.

Local authority or other organisation	Method/dates of contact	Information provided and/or specific concerns
	27 June 2013; and 8 July 2013.	
Ministry of Defence (MoD)	Contact made through HS2 Ltd on unspecified date.	Requests for information on Royal Air Force (RAF) sites in the study area have been made - no information received at time of producing this report

### 3 Detailed risk assessment

3.1.1 This section presents assessments for areas potentially posing a contaminative risk for the Proposed Scheme within the study area. For each site the following data are presented:

- baseline risk assessment;
- construction risk assessment;
- post-construction risk assessment; and
- assessment of temporary (construction) and permanent (post-construction) effects.

3.1.2 This risk assessment incorporates the following assumptions:

- construction workers are not included as part of this assessment;
- sites that have been assessed as potentially posing a contaminative risk to the Proposed Scheme have been grouped and considered together where appropriate. It should be noted that some parcels of land may have had several land uses from different epochs;
- during construction standard mitigation procedures will be in place in accordance with the draft Code of Construction Practice (CoCP) (Volume 5: Appendix CT-003-000); and
- during the post-construction condition it is assumed that all required remediation has been undertaken and carried out.

3.1.3 The sites assessed in this study area are shown on Maps LQ-01-035 to LQ-01-041 in Volume 5, Land Quality Map Book.

Table 2: Sites included in the detailed risk assessment within the study area

Area reference	Area name	Table numbers
15-1	Dismantled railway crossing the route	3, 12, 21, 30
15-4	Historical limestone quarry	4, 13, 22, 31
15-6	Historical quarry	5, 14, 23, 32
15-7	Historical limestone quarry	6, 15, 24, 33
15-8	Tanks at Blackgrounds Farm	7, 16, 25, 34
15-9	Historical quarry	8, 17, 26, 35
15-10	Former RAF Chipping Warden Airfield	9, 18, 27, 36
15-12	Sewage works	10, 19, 28, 37
15-20	Former RAF Greatworth Wireless Transmission Station, now Greatworth Park Trading Estate and farmland	11, 20, 29, 38

- 3.1.4 Contaminant types included within the risk assessments are based on the Priority Contaminants Report CLR 8<sup>1</sup>. Although withdrawn, this document is still commonly used and is considered good practice.
- 3.1.5 The remainder of this section presents the risk assessment for the sites set out in Table 2. The following acronyms are used in these tables:
- CSM - conceptual site model; and
  - VOC - volatile organic compounds.

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<sup>1</sup> Defra and Environment Agency, (2002), *Potential contaminants for the assessment of land- R&D Publication*, Bristol, Environment Agency.

### 3.1 Baseline risk assessment

Table 3: Baseline CSM and qualitative risk assessment – dismantled railway crossing the route (Area ref 15-1)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Dismantled railway (at grade)  Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use  Adjacent commercial premises (Greatworth Hall)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Controlled waters  Principal Taynton Limestone aquifer at surface on the north-eastern extremity of area ref 15-1  Remainder of area ref 15-1 is on unproductive strata	Vertical and lateral migration of contaminated groundwater	Low likelihood	Moderate	Moderate/low
	Property  Adjacent commercial premises (Greatworth Hall)	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	Controlled waters  Principal Taynton Limestone aquifer at surface on the north-eastern extremity of area ref 15-1  Remainder of area ref 15-1 is on unproductive strata	Vertical and lateral migration of contaminated groundwater	Low likelihood	Moderate	Moderate/low
	Property  Adjacent commercial premises (Greatworth Hall)	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 4: Baseline CSM and qualitative risk assessment – historical limestone quarry (Area ref 15-4)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Principal Taynton Limestone aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	Low likelihood	Moderate	Moderate/low

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Table 5: Baseline CSM and qualitative risk assessment – historical quarry (Area ref 15-6)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface on-site  Secondary A alluvium and Secondary undifferentiated Dyrham Formation aquifers adjacent at surface	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low

Table 6: Baseline CSM and qualitative risk assessment – historical limestone quarry (Area ref 15-7)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low

Table 7: Baseline CSM and qualitative risk assessment – tanks at Blackgrounds Farm (Area ref 15-8)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Contaminants that could be present include, but are not limited to: fuels, slurry, and pesticides	Sensitive land use Housing on-site (farm) Workers on-site (farm)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Controlled waters Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater	Unlikely	Minor	Very low
	Property Farm on-site	Lateral migration and concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

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Table 8: Baseline CSM and qualitative risk assessment – historical quarry (Area ref 15-9)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low

Table 9: Baseline CSM and qualitative risk assessment – former RAF Chipping Warden Airfield (Area ref 15-10)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, anti-freeze/de-icers (e.g. glycols), fire-fighting foams, cleaning agents, asbestos, explosives	Sensitive land use	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Moderate	Low
	Housing on-site (farms)				
	Commercial premises on-site (Appletree Industrial Estate)	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
	Adjacent housing and commercial properties within 50m	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters  Largely Unproductive strata at surface  Secondary A Marlstone Rock formation aquifer at surface around north-western and south-eastern perimeters of area ref 15-	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
	10				
	Property Housing on-site (farms) Commercial premises on-site (Appletree Industrial Estate)	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Adjacent housing and commercial properties within 50m	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 10: Baseline CSM and qualitative risk assessment – sewage works (Area ref 15-12)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane, carbon dioxide and VOC if sludge was buried	Sensitive land use On-site sewage works employees Adjacent residents/nursery workers	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Property On-site buildings Adjacent buildings	Concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with	Unlikely	Negligible	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
		contaminated groundwater/soil			

Table 11: Baseline CSM and qualitative risk assessment – former RAF Greatworth Wireless Transmission Station, now Greatworth Park Trading Estate and farmland (Area ref 15-20)

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, asbestos	Sensitive land use  Commercial premises on-site (Greatworth Park)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters  Unproductive strata (Till) at surface south-eastern perimeters of area ref 15-20  Principal Taynton Limestone aquifer at surface south-eastern perimeters of area ref 15-20	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Property  Commercial premises on-site (Greatworth Park)	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
		Direct contact of below ground building structures and services with contaminated	Unlikely	Negligible	Very low

Source	Receptor	Pathway	Probability	Consequence	Risk at baseline without mitigation
		groundwater/soil			

## 3.2 Construction risk assessment

Table 12: Construction CSM and qualitative risk assessment – dismantled railway crossing the route (Area ref 15-1)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Dismantled railway (at grade)  Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use  Adjacent commercial premises (Greatworth Hall)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Controlled waters  Principal Taynton Limestone aquifer at surface on the north-eastern extremity of area ref 15-1  Remainder of area ref 15-1 is on unproductive strata	Vertical and lateral migration of contaminated groundwater	Low likelihood	Moderate	Moderate/low
	Property  Adjacent commercial premises (Greatworth Hall)	Concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 13: Construction CSM and qualitative risk assessment – historical limestone quarry (Area ref 15-4)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Principal Taynton Limestone aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	Low likelihood	Moderate	Moderate/low

Table 14: Construction CSM and qualitative risk assessment – historical quarry (Area ref 15-6)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface on-site  Secondary A alluvium and Secondary undifferentiated Dyrham Formation aquifers adjacent at surface	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low

Table 15: Construction CSM and qualitative risk assessment – historical limestone quarry (Area ref 15-7)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	No contaminant linkage	No contaminant linkage	None

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
chloride, and ground gases (largely methane, carbon dioxide and VOC)					

Table 16: Construction CSM and qualitative risk assessment – tanks at Blackgrounds Farm (Area ref 15-8)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Contaminants that could be present include, but are not limited to: fuels, slurry, and pesticides	Sensitive land use Housing on-site (farm) Workers on-site (farm)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	No contaminant linkage	No contaminant linkage	None
		Inhalation of vapours derived from contaminated groundwater/soil	No contaminant linkage	No contaminant linkage	None
		Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater	No contaminant linkage	No contaminant linkage	None
	Property Farm on-site	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
		Direct contact of below ground building structures and services with contaminated groundwater/soil	No contaminant linkage	No contaminant linkage	None

Table 17: Construction CSM and qualitative risk assessment – historical quarry (Area ref 15-9)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low

Table 18: Construction CSM and qualitative risk assessment – former RAF Chipping Warden Airfield (Area ref 15-10)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, anti-freeze/de-icers (e.g. glycols), fire-fighting foams, cleaning agents, asbestos, explosives	Sensitive land use	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Moderate	Low
	Housing on-site (farms)				
	Commercial premises on-site (Appletree Industrial Estate)	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
	Adjacent housing and commercial properties within 50m	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters  Largely Unproductive strata at surface  Secondary A Marlstone Rock formation aquifer and Secondary undifferentiated Dyrham	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
	Formation aquifer at surface around north-western and south-eastern perimeters of area ref 15-10				
	Property Housing on-site (farms) Commercial premises on-site (Appletree Industrial Estate)	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Adjacent housing and commercial properties within 50m	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 19: Construction CSM and qualitative risk assessment – sewage works (Area ref 15-12)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane, carbon dioxide and VOC if sludge was buried	Sensitive land use  On-site sewage works employees  Adjacent residents/nursery workers	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Property  On-site buildings  Adjacent buildings	Concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 20: Construction CSM and qualitative risk assessment – former RAF Greatworth Wireless Transmission Station, now Greatworth Park Trading Estate and farmland (Area ref 15-20)

Source	Receptor	Pathway	Probability	Consequence	Risk with construction stage mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, asbestos	Sensitive land use  Commercial premises on-site (Greatworth Park)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters  Unproductive strata (Till) at surface south-eastern perimeters of area ref 15-20  Principal Taynton Limestone aquifer at south-eastern perimeters of area ref 15-20	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Property  Commercial premises on-site (Greatworth Park)	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None

### 3.3 Post-construction risk assessment

Table 21: Post-Construction CSM and qualitative risk assessment – dismantled railway crossing the route (Area ref 15-1)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Dismantled railway (at grade)  Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling	Sensitive land use  Adjacent commercial premises (Greatworth Hall)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Moderate	Low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
	Controlled waters  Principal Taynton Limestone aquifer at surface on the north-eastern extremity of area ref 15-1  Remainder of area ref 15-1 is on unproductive strata	Vertical and lateral migration of contaminated groundwater	Low likelihood	Moderate	Moderate/low
	Property  Adjacent commercial premises (Greatworth Hall)	Concentration of asphyxiative or explosive gases	Unlikely	Severe	Moderate/low
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

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Table 22: Post-Construction CSM and qualitative risk assessment – historical limestone quarry (Area ref 15-4)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e. g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Principal Taynton Limestone aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	Low likelihood	Moderate	Moderate/low

Table 23: Post-Construction CSM and qualitative risk assessment – historical quarry (Area ref 15-6)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface on-site  Secondary A alluvium and Secondary undifferentiated Dyrham Formation aquifers adjacent at surface	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low

Table 24: Post-Construction CSM and qualitative risk assessment – historical limestone quarry (Area ref 15-7)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	No contaminant linkage	No contaminant linkage	None

Table 25: Post-Construction CSM and qualitative risk assessment – tanks at Blackgrounds Farm (Area ref 15-8)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Contaminants that could be present include, but are not limited to: fuels, slurry, and pesticides	Sensitive land use  Housing on-site (farm)  Workers on-site (farm)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	No contaminant linkage	No contaminant linkage	None
		Inhalation of vapours derived from contaminated groundwater/soil	No contaminant linkage	No contaminant linkage	None
		Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater	No contaminant linkage	No contaminant linkage	None
	Property  Farm on-site	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
		Direct contact of below ground building structures and services with contaminated groundwater/soil	No contaminant linkage	No contaminant linkage	None

Table 26: Post-Construction CSM and qualitative risk assessment – historical quarry (Area ref 15-9)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC)	Controlled waters  Secondary A Marlstone Rock formation aquifer at surface	Vertical and lateral migration of contaminated groundwater/leachate	Unlikely	Minor	Very low

Table 27: Post-Construction CSM and qualitative risk assessment – former RAF Chipping Warden Airfield (Area ref 15-10)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, anti-freeze/de-icers (e.g. glycols), fire-fighting foams, cleaning agents, asbestos, explosives	Sensitive land use	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Unlikely	Moderate	Low
	Housing on-site (farms)				
	Commercial premises on-site (Appletree Industrial Estate)	Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
	Adjacent housing and commercial properties within 50m	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Secondary A Marlstone Rock formation aquifer and Secondary undifferentiated Dyrham Formation aquifer at surface around north-western and south-eastern perimeters of area ref 15-10				
	Property	Lateral migration and concentration of asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Housing on-site (farms)				
	Commercial premises on-site (Appletree Industrial Estate)	Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low
	Adjacent housing and commercial properties within 50m				

Table 28: Post-Construction CSM and qualitative risk assessment – sewage works (Area ref 15-12)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Heavy metals, organic compounds e.g. oils, pathogens from sludge which may have been spreading on surrounding land. Also methane, carbon dioxide and VOC if sludge was buried	Sensitive land use  On-site sewage works employees  Adjacent residents/nursery workers	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Unlikely	Moderate	Low
		Exposure to asphyxiative or explosive gases	Low likelihood	Severe	Moderate
	Property  On-site buildings  Adjacent buildings	Concentration of asphyxiative or explosive gases	Low likelihood	Severe	Moderate
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

Table 29: Post-Construction CSM and qualitative risk assessment – former RAF Greatworth Wireless Transmission Station, now Greatworth Park Trading Estate and farmland (Area ref 15-20)

Source	Receptor	Pathway	Probability	Consequence	Risk with permanent works mitigation
Contaminants that could be present include, but are not limited to: fuels and oils, degreasants, paints, asbestos	Sensitive land use  Commercial premises on-site (Greatworth Park)	Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust	Low likelihood	Moderate	Moderate/low
		Inhalation of vapours derived from contaminated groundwater/soil	Low likelihood	Moderate	Moderate/low
		Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
	Controlled waters  Unproductive strata (Till) at surface across south-eastern perimeters of area ref 15-20  Principal Taynton Limestone aquifer at south-eastern perimeters of area ref 15-20	Vertical and lateral migration of contaminated groundwater	Low likelihood	Minor	Low
	Property  Commercial premises on-site (Greatworth Park)	Exposure to asphyxiative or explosive gases	No contaminant linkage	No contaminant linkage	None
		Direct contact of below ground building structures and services with contaminated groundwater/soil	Unlikely	Negligible	Very low

### 3.4 Assessment of temporary (construction) and permanent (post-construction) effects

Table 30: Significance of impact during construction and post construction – dismantled railway crossing the route (Area ref 15-1)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent commercial premises employees (Greatworth Hall)	Low	Low	Low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/ soil by adjacent commercial premises employees (Greatworth Hall)	Low	Low	Low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by adjacent commercial premises employees (Greatworth Hall)	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Vertical and lateral migration of contaminated groundwater into the Principal Taynton Limestone aquifer at surface	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Lateral migration and concentration of asphyxiative or explosive gases in adjacent commercial premises (Greatworth Hall)	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Direct contact of below ground building structures and services at adjacent Greatworth Hall with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 31: Significance of impact during construction and post construction – historical limestone quarry (Area ref 15-4)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Vertical and lateral migration of contaminated groundwater/leachate into the Principal Taynton Limestone aquifer at surface	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 32: Significance of impact during construction and post construction – historical quarry (Area ref 15-6)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Vertical and lateral migration of contaminated groundwater/leachate into the Secondary A Marlstone Rock formation aquifer at surface on-site, and Secondary A alluvium and Secondary undifferentiated Dyrham Formation aquifers adjacent at surface	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 33: Significance of impact during construction and post construction – historical limestone quarry (Area ref 15-7)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Vertical and lateral migration of contaminated groundwater/leachate into the Secondary A Marlstone Rock formation aquifer at surface	Very low	None	None	Minor beneficial effect	Minor beneficial effect
Overall significance				Minor beneficial effect	Minor beneficial effect

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Table 34: Significance of impact during construction and post construction – tanks at Blackgrounds Farm (Area ref 15-8)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site farm residents and workers	Low	None	None	Moderate beneficial effect	Moderate beneficial effect
Inhalation of vapours derived from contaminated groundwater/ soil by on-site farm residents and workers	Low	None	None	Moderate beneficial effect	Moderate beneficial effect
Exposure to asphyxiative or explosive gases by on-site farm residents and workers	Moderate/low	None	None	Moderate beneficial effect	Moderate beneficial effect
Vertical and lateral migration of contaminated groundwater/leachate into the Secondary A Marlstone Rock formation aquifer at surface	Very low	None	None	Minor beneficial effect	Minor beneficial effect
Concentration of asphyxiative or explosive gases in on-site farm buildings	Moderate/low	None	None	Moderate beneficial effect	Moderate beneficial effect
Direct contact of below ground building structures and services on-site with contaminated groundwater/soil	Very low	None	None	Minor beneficial effect	Minor beneficial effect
Overall significance				Minor beneficial effect	Minor beneficial effect

Table 35: Significance of impact during construction and post construction – historical quarry (Area ref 15-9)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Vertical and lateral migration of contaminated groundwater/leachate into the Secondary A Marlstone Rock formation aquifer at surface	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 36: Significance of impact during construction and post construction – former RAF Chipping Warden Airfield (Area ref 15-10)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site residents, commercial premises employees (Appletree Industrial Estate) and properties within 50m	Low	Low	Low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/ soil by on-site residents, commercial premises employees (Appletree Industrial Estate) and properties within 50m	Low	Low	Low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by on-site residents, commercial premises employees (Appletree Industrial Estate) and properties within 50m	None	None	None	Negligible	Negligible
Vertical and lateral migration of contaminated groundwater into the Secondary A marlstone rock aquifer at surface and undifferentiated Dyrham Formation aquifer	Low	Low	Low	Negligible	Negligible
Concentration of asphyxiative or explosive gases in on-site residents, commercial premises users (Appletree Industrial Estate) and properties within 50m	None	None	None	Negligible	Negligible
Direct contact of below ground building structures and services on-site and within 50m with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 37: Significance of impact during construction and post construction – sewage works (Area ref 15-12)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site sewage works employees and adjacent residents/employees	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/soil by on-site sewage works employees and adjacent residents/employees	Low	Low	Low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by on-site sewage works employees and adjacent residents/employees	Moderate	Moderate	Moderate	Negligible	Negligible
Concentration of asphyxiative or explosive gases in on-site and adjacent buildings	Moderate	Moderate	Moderate	Negligible	Negligible
Direct contact of below ground building structures and services on-site and adjacent with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

Table 38: Significance of impact during construction and post construction – former RAF Greatworth Wireless Transmission Station, now Greatworth Park Trading Estate and farmland (Area ref 15-20)

Contaminant linkage	Baseline risk	Construction risk	Post-construction risk	Construction significance	Post-construction significance
Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site employees (Greatworth Park)	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Inhalation of vapours derived from contaminated groundwater/ soil by on-site employees (Greatworth Park)	Moderate/low	Moderate/low	Moderate/low	Negligible	Negligible
Exposure to asphyxiative or explosive gases by on-site employees (Greatworth Park)	None	None	None	Negligible	Negligible
Vertical and lateral migration of contaminated groundwater into unproductive strata (Till) and Principal Taynton Limestone aquifer at surface	Low	Low	Low	Negligible	Negligible
Concentration of asphyxiative or explosive gases in on-site commercial premises (Greatworth Park)	None	None	None	Negligible	Negligible
Direct contact of below ground building structures and services on-site with contaminated groundwater/soil	Very low	Very low	Very low	Negligible	Negligible
Overall significance				Negligible	Negligible

## 4 Inspections notes and other site data

4.1.1 This appendix presents site inspection notes for those key potentially contaminated sites visited during the study period. No other site data was obtained.

Table 39: Site inspection data from area ref 15-4

Inspection location (Land Parcel Ref: N/A)	Details	
Area ref number	15-4	
Date of inspection	31 January 2013	
Site location	Farm Land Banbury Lane, Thorpe Mandeville, Banbury	
Site access	Gate off Banbury Lane	
Site description	Historic limestone quarry now used for cattle grazing. Open field, no buildings	
Topography and surroundings - elevation in relation to surroundings, hummocks or breaks of slope	Rolling hills as per surrounding area. Noticeable dip in landscape at location of former quarry	
Neighbouring site use (in particular note any potentially contaminative activities or sensitive receptors)	North	Grazing fields
	South	Grazing fields
	East	Grazing fields
	West	Grazing fields
Site buildings - extent, size, type and usage. Boiler rooms, electrical switchgear	None	
Ground surfacing - type and condition	Grass field. No surfacing	
Vegetation - evidence of distress, unusual growth or invasive species	No evidence of distress observed	
Evidence of ground contamination	None observed	
Services - evidence of buried services	None observed	

## **5 Geological sites of special scientific interest and local geological sites**

5.1.1 There are no geo-conservation resources identified within the study area.

## 6 Mining and minerals data

- 6.1.1 Within the study area there are four mineral safeguarding areas as designated by Northamptonshire County Council which are all for sand and gravel resources. These are located at the southern end of the route section, north of Radstone, south-east of Halse Copse, in the vicinity of Trafford Bridge and south of Chipping Warden.
- 6.1.2 Five Britpit (British Pits) locations have been identified by British Geological Survey (BGS) and are likely to have been used historically for abstraction of minerals; namely Greatworth, Culworth Grounds, Danesmoor Spinney, Culworth Mill and Jobs Hill Sand Pit. No other mining or quarrying activities have been identified in the area. All the pits are classified by BGS as having 'pit status C' (a site which, at date of entry, has ceased to extract minerals) (see Maps LQ-01-035 to LQ-01-039 Volume 5, Land Quality Map Book).
- 6.1.3 The BGS has identified the presence of deep coal resources north of Greatworth and Thorpe Mandeville that are between approximately 200m and 600m deep from the surface increasing northwards.
- 6.1.4 There are no mining or mineral sites in this part of the route that are currently being worked or that have planning permission.

## 7 References

Defra and Environment Agency, (2002), *Potential contaminants for the assessment of land - R&D Publication*, Bristol, Environment Agency.